General Installation Manual

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General Installation Manual for SANYO HIT Photovoltaic Modules. Please read this manual completely before use or installation of SANYO modules. This manual applies to the following models:

HIP-205BA3, HIP-200BA3, HIP-195BA3, HIP-190BA3, HIP-186BA3, HIP-180BA3, HIP-175BA3, HIP-205BA5, HIP-200BA5, HIP-195BA5, HIP-190BA5, HIP-186BA5, HIP-180BA5

INTRODUCTION

Thank you for choosing SANYO HIT® photovoltaic (PV) modules. With proper operation and maintenance, SANYO HIT PV modules will provide you with clean, renewable solar electricity for many years. This manual contains important installation, maintenance and safety information. The word "module" as used in this manual refers to one or more PV modules.

Retain this manual for future reference.

Disclaimer of Liability

SANYO does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of, or in any way connected with installation, operation, use, or maintenance by using this manual.

SANYO assumes no responsibility for any infringement of patents or other rights of third parties, which may result from use of modules.

No license is granted by implication or under any patent or patent rights. The information in this manual is believed to be reliable, but does not constitute an expressed and/or implied warranty.

SANYO reserves the right to make changes to the product, specifications, or manual without prior notice.

General Information

The installation of solar modules requires a great degree of skill and should only be performed by qualified licensed professionals, including, without limitation, licensed contractors and licensed electricians.

⚠ WARNING

- **All instructions should be read and understood before attempting to install, wire, operate, and maintain the photovoltaic module. Contact with electrically active parts of the module such as terminals can result in burns, sparks, and lethal shock whether the module is connected or disconnected.**
- **The installer assumes the risk of all injury that might occur during installation, including, without limitation, the risk of electric shock.**
- **PV modules generate DC electrical energy when exposed to sunlight or other light sources. Although single modules produce only a low voltage and current, shocks and burns are still a potential hazard.**
- **To avoid the hazard of electric shock and injury, cover the entire front surface of the PV modules with a dense, opaque material such as a cardboard box, during installation and handling of the modules.**
- **The shock hazard increases as modules are connected in parallel, producing higher current, and as modules are connected in series, producing higher voltages.**
- **To avoid the hazard of electric shock, work only in dry conditions, with dry modules and dry tools.**
- **Do not stand or step on a module to avoid the hazard of injury and damage to the module.**
- **Do not puncture or damage the back sheet of a module, to avoid the hazard of electric shock and fire.**
- **To avoid the hazard of electric shock and injury, children and unauthorized persons should not be allowed near the installation of PV modules.**
- **To avoid the hazard of electric shock and injury, be sure to completely ground all modules.**
- **To avoid the hazard of electric shock, fire, and injury, do not disassemble the module, or remove any part installed by the manufacturer.**
- **Unauthorized persons—except the qualified licensed professional—should not open the cover of the junction box to avoid the hazard of electric shock.**
- **Provide suitable guards to prevent yourself from direct contact with 30 VDC or greater to avoid the hazard of electric shock or injury.**
- **When carrying a module, two or more people should carry it by its frame and wear non-slip gloves (to avoid injury by a slipping module, to a foot, or cuts by the edge of a frame, and so on).**
- **Do not carry a module by its wires or junction box, to avoid the hazard of electric shock, injury or damage to the module.**
- **Do not drop anything on the surfaces of a module, to avoid the hazard of electric shock, injury, and damage.**
- **To avoid the hazard of electric shock and fire, be sure that all other system components are compatible, and they do not subject the module to mechanical or electrical hazards.**
- **Since sparks may occur, do not install the module where flammable gases or vapors are present.**
- **Never leave a module unsupported or unsecured.**
- **Do not drop a module.**
- **Do not use or install broken modules to avoid the hazard of fire, electric shock, and injury.**
- **Do not artificially concentrate sunlight on a module to avoid the hazard of fire or damage.**
- **Do not touch the junction box terminals to avoid the hazard of electric shock and injury.**
- **Do not change the wiring of bypass diodes to avoid the hazard of electric shock and injury.**

⚠ CAUTIONS

- **Use a module for its intended purpose only.**
- **Do not treat the back sheet, frame, or front surface with paint or adhesives, to avoid reducing its' functionality, damage, inoperable conditions, and other unknown troubles.**

GENERAL SAFETY

Follow all permission, installation and inspection requirements.

- Before installing modules, contact the appropriate authorities to determine permissions, installation and inspection requirements, which should be followed.
- Electrically ground modules for all systems of any voltage. If not otherwise specified, it is recommended that requirements of the latest National Electrical Code (USA) or Canadian Electric Code (Canada) or other national or international electrical standards be followed.
- Be sure that the construction or structure (roof, façade, etc.) where the modules are being installed has enough strength.
- For modules mounted on roofs, special construction or structures may be required to help provide proper installation support.

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- Both roof construction and module installation design have an effect on the fire resistance of a building. Improper installation may contribute to fire hazards. Additional devices such as ground fault, fuses, and disconnects may be required.
- Do not use modules of different specifications in the same system.
- Follow all safety precautions of other system components used.

UL Listing Information

To satisfy UL requirements, when installing the modules, be sure to:

1) Use only stranded or solid copper single–conductor type UF cable or USE cable, rated sunlight resistant, for modules and interconnect wiring that is exposed to weather.
2) Observe the requirements described in sections labeled INSTALLTION and SPECIFICATIONS.
3) Grounding of the module frame is required. When ground wires greater than 6mm^2 (No.10 AWG) are required, the installer will need to provide suitable terminal connectors.

INSTALLATION

General

- Please read this guide completely before installation or use of the modules. This section contains electrical and mechanical specifications needed before using your SANYO PV modules.
- Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads.
- The drilling and addition of ground holes is permitted, but should be avoided when possible, to prevent damage to the module. Caution is advised to avoid accidentally drilling, scratching, or penetrating the back sheet surface of the module. When needed, it is recommended to add additional ground holes to the outer aluminum lip (rail) area of the module. The position of additional ground holes must be at least 65mm away from frame corners and must not penetrate the inner side of the aluminum frame.
- Appropriate material should be used for mounting hardware to prevent the module frame, mounting structure, and hardware itself from corrosion.
- Install modules where they are not shaded by obstacles like buildings and trees. Especially pay attention to avoid partially shading the modules by objects during the daytime.
- Please contact your SANYO Authorized Representative with questions regarding mounting profiles for modules if needed.

Notes on Installation

- Clearance between the roof surface and module frame is required to allow cooling air to circulate around the back of the module. This also allows any condensation or moisture to dissipate. Install modules so that air can circulate between the roof and the module.
- Leave 4 inches of clearance between the roof and the module frame.

Operating Conditions

SANYO requires that modules be operated within the following Operating Conditions:

1) Terrestrial applications only—no outer space or Special Conditions (see below).
2) The ambient temperature must be within –20°C (-4°F) to 40°C (104°F). The temperature limits are defined as the Monthly Average High or Low of the installation site.
3) The wind pressure load of the installation site should be less than 2,400N/m^2 (50PSF).

Special Conditions

Modules must not be installed nor operated in areas where:

1) Salt damage is excessive.
2) Hail and snow damage is excessive.
3) Sand and dust damage is excessive.
4) Air pollution, chemically active vapors, acid rain, soot, etc. are excessive.

SPECIFICATIONS

Notes on Specifications

1) Rated electrical characteristics are within –5% to +10% of the values measured at Standard Test Conditions (STC). Irradiance of 1000W/m, 25^{o}C cell temperature, and solar spectral irradiance per IEC 60904-3.
2) Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of Isc and Voc marked on UL listed modules should be multiplied by a factor of 1.25 when determining voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the module output. **USA: Refer to Section 690-7 of the U.S. National Electrical Code for an additional multiplying factor of 1.25, which may be applicable.**
3) The current output for the modules shown in the Specifications is measured at Standard Test Conditions. These conditions may not be frequently observed in actual practice.

Mechanical Loading

- The modules should be mounted at the four (4) quarter points by the means shown in Figures 3.1 and 3.2.
- This method offers a maximum load of 2400N/m2 (50PSF, in a static state) on the module surface.

WIRING

General

- All wiring should be done in accordance with applicable electrical codes.
- **Wiring methods should be in accordance with the NEC in USA or CEC in Canada.**
- A qualified, licensed professional should do all wiring.
- Wiring should be protected to help ensure personal safety and to prevent its damage.
- All modules connected in series should be of the same model number and/or type.
- Do not connect modules in parallel without using a connection box.

Module Wiring

- The number of modules that can be wired in series is recommended at seven (7) or fewer. If connecting eight (8) modules in series, check local temperature conditions and follow the National Electric Code (690.7) to ensure compliance with maximum voltage limitations.
- SANYO solar modules are not designed for “off-grid” or battery charging systems, because of their operating voltage. Therefore, it is not recommended to use them to charge batteries.
- These modules contain factory installed bypass diodes. If these modules are incorrectly connected to each other, the bypass diodes, cable, or junction box may be damaged.

Module Wiring

- The term “array” is used to describe the assembly of several modules on a support structure with associated wiring.
- Use copper wire that is sunlight resistant and is insulated to withstand the maximum possible system open circuit voltage.

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- Check local codes for requirements.

Earth Ground Wiring

- Grounding should be carried out by attachment to the module or array frame, to avoid the hazards of electric shock or fire.
- The array frame shall be grounded in accordance with NEC Article 250 (USA) or CEC in Canada.
- Each framed module has a hole in the shorter side frame rail, to connect a grounding conductor to the module's metal frame (see Figure 2).

Module Terminations

- A junction box as a terminal enclosure is equipped for electrical connections on SANYO modules.
- Modules are equipped with MC™ plugs as a terminal enclosure. Use these MC™ plugs for electrical connections.

Junction Box and Terminals

- Modules equipped with one junction box contain terminals for both positive and negative polarity, and bypass diodes.
- One terminal is dedicated to each polarity (with the polarity symbols engraved onto the body of the junction box) (see Figure 4).

Conduit

- For applications where wire conduits are used, follow the applicable codes for outdoor installation of wires in conduits.
- Verify that all fittings are properly installed to protect wires against damage and prevent moisture intrusion.

DIODES

Bypass Diodes

- When the modules in series strings are shaded partially, it may cause reverse voltage across cells or modules, because the current from other cells in the same series is forced to flow through the shaded area. This may cause undesirable heating to occur.
- The use of a diode to bypass the shaded area can minimize both heating and array current reduction.
- All SANYO modules are equipped with factory installed bypass diodes. The factory-installed diodes provide proper circuit protection for the systems within the specified system voltage, so that you do not need any other additional bypass diodes.
- Contact your SANYO Authorized Representative for proper diode type, if it is necessary to add or change diodes due to system specifications.

MAINTENANCE

- Some maintenance is recommended to maintain optimal output performance of the solar modules.
- If the module surface becomes dirty, it may reduce output power.
- It is recommended to clean the surface of the module with water and a soft cloth or sponge, twice or more per year.
- A mild non-abrasive detergent may be applied for persistent dirt.
- It is also recommended to inspect the electrical and mechanical connections annually.
- If you need electrical or mechanical inspection or maintenance, it is recommended to have a licensed authorized professional carry out the inspection or maintenance to avoid the hazards of electric shock or injury.

The return of any modules will not be accepted by SANYO unless prior written authorization has been given by SANYO.

As part of SANYO's policy of continuous improvement, SANYO reserves the right to change product specifications at any time without prior notice.

For further information, please visit www.us.sanyo.com or contact your SANYO Authorized Representative.

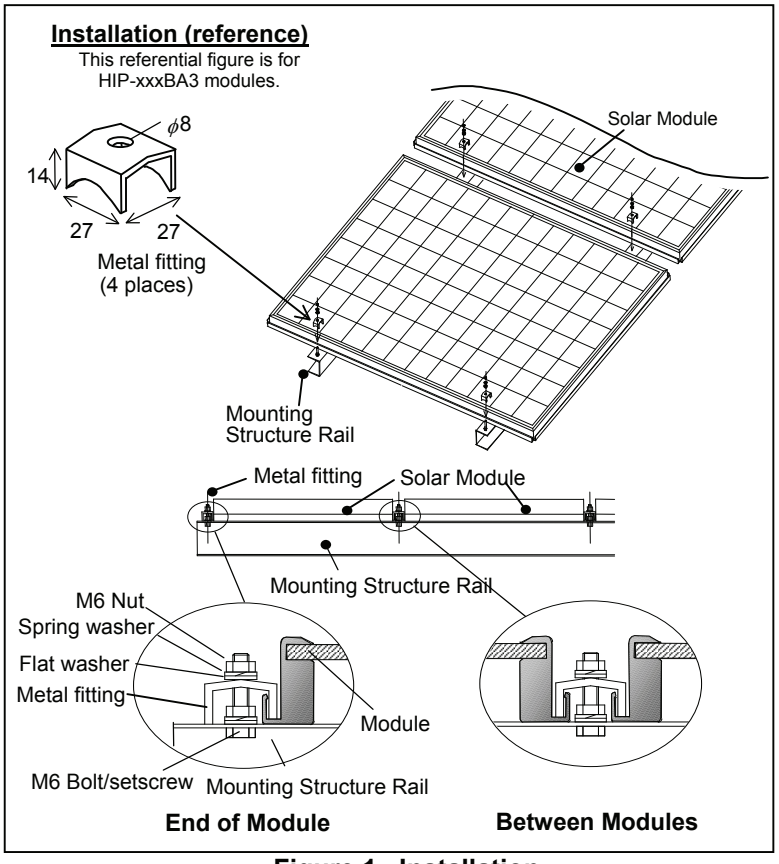

Figure 1. Installation

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SPECIFICATIONS

Standard Models—HIP-xxxBA3 Series

Electrical Specifications							
Model	**HIP-205BA3**	**HIP-200BA3**	**HIP-195BA3**	**HIP-190BA3**	**HIP-186BA3**	**HIP-180BA3**	**HIP-175BA3**
Cell Number in Series	96	96	96	96	96	96	96
Rated Power, Watts (Pmax)	205	200	195	190	186	180	175
Maximum Power Voltage (Vpm)	56.7	55.8	55.3	54.8	54.4	54.0	52.9
Maximum Power Current (Ipm)	3.62	3.59	3.53	3.47	3.42	3.33	3.31
Open Circuit Voltage (Voc)	68.8	68.7	68.1	67.5	67.0	66.4	65.7
Short Circuit Current (Isc)	3.84	3.83	3.79	3.75	3.71	3.65	3.64
Cell Type	HIT*	HIT*	HIT*	HIT*	HIT*	HIT*	HIT*
Maximum System Voltage (Voc)	600	600	600	600	600	600	600
Factory Installed Bypass Diodes	4	4	4	4	4	4	4

Mechanical Specifications							
Model	HIP-205BA3	HIP-200BA3	HIP-195BA3	HIP-190BA3	HIP-186BA3	HIP-180BA3	HIP-175BA3
Length, mm (inches)	1319 (51.9)						
Width, mm (inches)	894 (35.2)						
	35 (1.4)						
Weight, kg (pounds)	14 (30.9)						

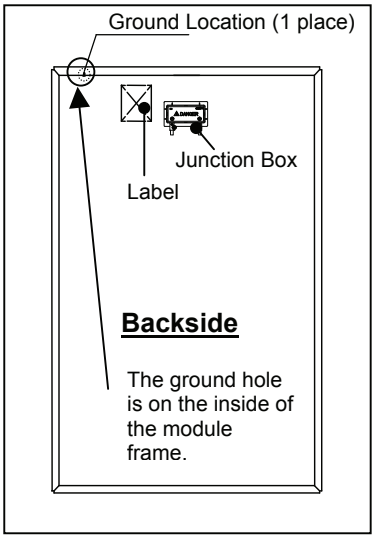
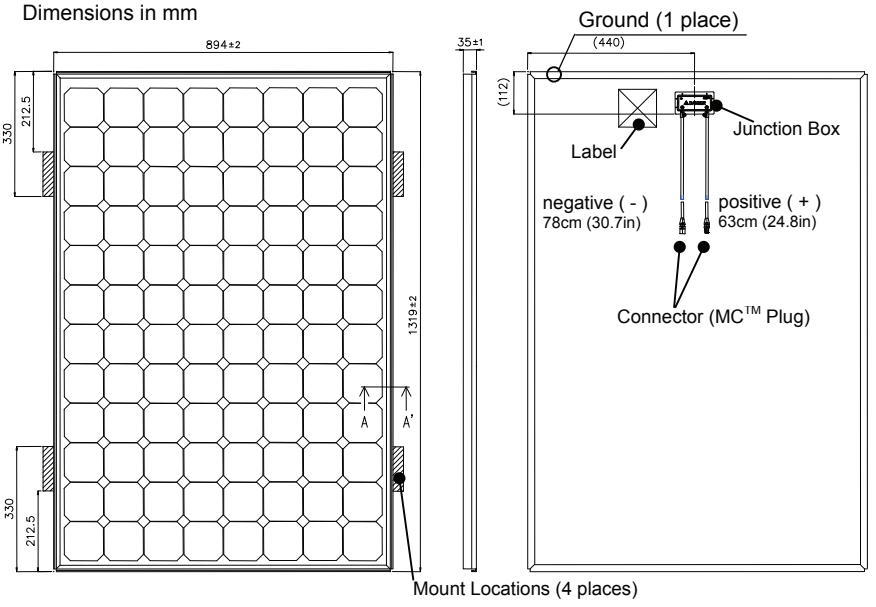


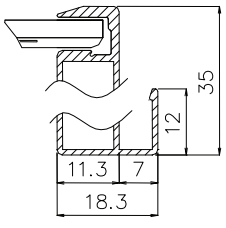
Figure 2.
Module Ground Position

Dimensions

Standard Models: HIP-205BA3, HIP-200BA3, HIP-195BA3, HIP-190BA3, HIP-186BA3, HIP-180BA3, HIP-175BA3



Note: A module should be attached on a mount or support structure rail within the shaded range.



Section A-A'

Figure 3.1 Standard Model Dimensions

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SPECIFICATIONS

Deep-Frame Models—HIP-xxxBA5 Series

Electrical Specifications						
Model	**HIP-205BA5**	**HIP-200BA5**	**HIP-195BA5**	**HIP-190BA5**	**HIP-186BA5**	**HIP-180BA5**
Cell Number in Series	96	96	96	96	96	96
Rated Power, Watts (Pmax)	205	200	195	190	186	180
Maximum Power Voltage (Vpm)	56.7	55.8	55.3	54.8	54.4	54
Maximum Power Current (Ipm)	3.62	3.59	3.53	3.47	3.42	3.33
Open Circuit Voltage (Voc)	68.8	68.7	68.1	67.5	67.0	66.4
Short Circuit Current (Isc)	3.84	3.83	3.79	3.75	3.71	3.65
Cell Type	HIT*	HIT*	HIT*	HIT*	HIT*	HIT*
Maximum System Voltage (Voc)	600	600	600	600	600	600
Factory Installed Bypass Diodes	4	4	4	4	4	4

Mechanical Specifications						
Model	HIP-205BA5	HIP-200BA5	HIP-195BA5	HIP-190BA5	HIP-186BA5	HIP-180BA5
Length, mm (inches)	1319 (51.9)					
Width, mm (inches)	894 (35.2)					
Frame Depth, mm (inches)	60 (2.4)					
Weight, kg (pounds)	14 (30.9)					

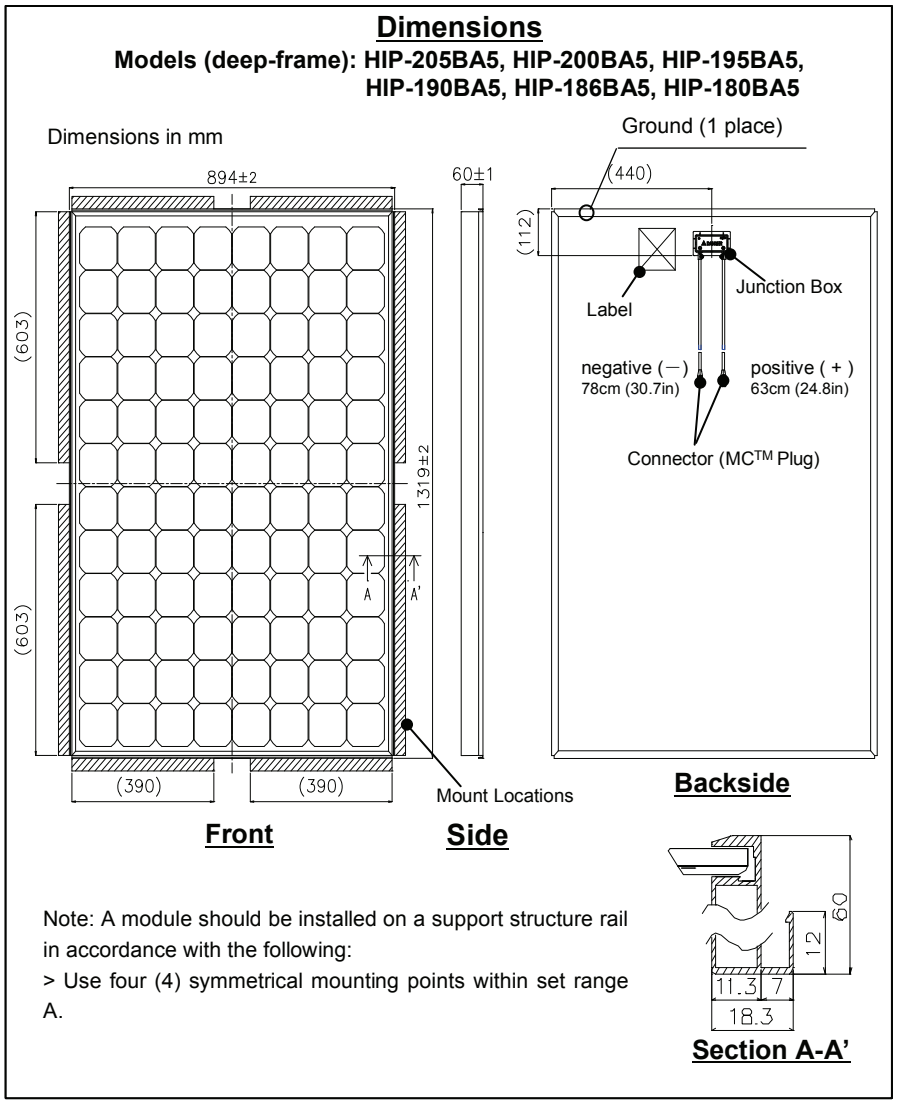

Figure 3.2 Deep-Frame Model Dimensions

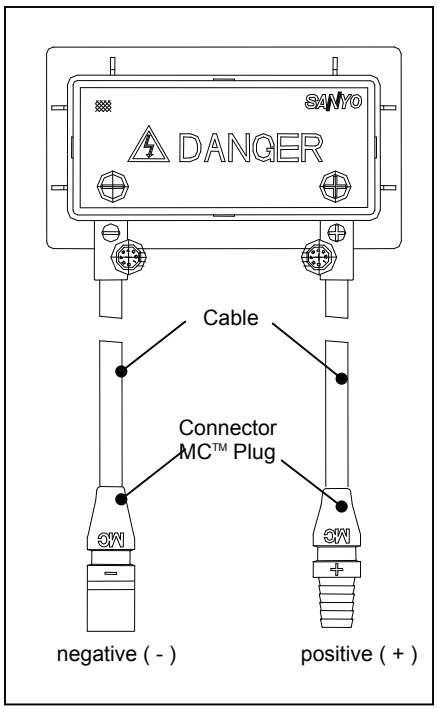

Figure 4. Configuration of Junction Box